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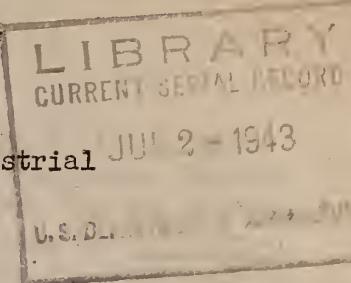


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PRESERVATION OF VEGETABLES BY SALTING AND BRINING

by

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INTRODUCTION

Many people are familiar with the production of sauer kraut from cabbage and the production of salt-stock and dill pickles from cucumbers. In these cases, salt is used as the principal agent in bringing about preservation. Preservation by the use of salt can be applied to other vegetables as well and should be especially useful when the usual methods of preservation, such as canning and freezing, cannot be employed due to lack of facilities, labor, or essential materials. It is a simple and inexpensive emergency method which may be used to prevent the waste of certain vegetables. Due to the nature of preservation by salt, the final product does not necessarily compare in general quality with that of similar canned products.

Methods of Salt Preservation

(Dry Salting)

There are but two basic methods of preservation depending upon the use of salt. In the dry salting method, dry salt is added directly to the vegetable material as it is packed. This brings water out of the vegetable material, dissolving the salt and thereby forming brine. If a small amount of salt is used, an active acid fermentation takes place. This process is brought about by microscopic plants called bacteria---in this case, beneficial bacteria---which use the sugars from the vegetables as food and produce acid. These tiny organisms are similar to those responsible for the souring of milk. Dry salting, using a small amount of salt (2-1/2 to 5 percent by weight), is usually employed for vegetables that are readily cut or shredded and that are high in water content, yet contain enough sugar to develop a vigorous acid fermentation. A preserving effect is obtained by the combined action of salt and the acid produced by the fermentation. Cabbage and lettuce are typical examples of materials that are salted in this manner. Blanched snap beans is another. Products preserved by this treatment have a tart flavor which is relished by many.

If a large amount of dry salt is used, little or no acid is produced since the acid-forming bacteria are unable to grow to any extent under this condition. Certain vegetables are best preserved when a large amount of salt (15 percent by weight) is used. Corn, lima beans, and green peas are examples of vegetables considered to be in this group. When a large amount of salt is used, the preserving effect is due principally to the action of salt alone.

(Brining)

The other basic method of preservation by the use of salt is called brining. In this case the salt (brine) solution is poured on the vegetables. Water is thereby withdrawn and the brine becomes diluted. When weak brines---those containing a small amount of salt---are used, an active acid fermentation takes place similar to that described for dry salting. If strong brines---those containing a large amount of salt---are used, little or no acid is produced. In general, brining is used for bulky or whole vegetables and those that may be low in water content. Also, brining may be used to advantage where the effect of shrinkage on the shape and structure of the vegetable material, caused by the use of dry salt, would be unduly severe. For some vegetables, a weak brine plus a small amount of vinegar is used. The addition of vinegar to the brine insures a desirable fermentation and aids in avoiding possible spoilage.

Precautions

The detailed directions given in the attached sheets outline two different methods of dry salting and two of brining. Each method is best adapted for use with particular vegetables. Study the methods and directions carefully and pick out the method best suited for the vegetable or vegetables that are to be preserved.

The directions must be carefully carried out if a satisfactory product is to be obtained. The vegetables must be carefully weighed out; the salt likewise must be weighed or measured as the directions call for. Pure, granulated salt should be used. It should not be coarse, nor should it contain any ingredients such as is commonly used for table salt to prevent caking. The following grades of pure salt are suggested for use: "Granulated"; "Preferred"; or "Evaporated Fine Flake".

When the dry salting procedure is used, the salt must be distributed uniformly throughout the entire mass of vegetable. Do not use too much salt at first.

Keep the brine surface free from insects and heavy scum growth.

Brined vegetables should be repacked shortly after the active fermentation for the purpose of reducing the attention required and to assure the keeping of the product over a period of several months.

Peas, beans, corn, and greens preserved by brining should be cooked before tasted and eaten. Discard material which is soft or has an objectionable odor. These recommendations are made for home-canned products and apply to salt-preserved products also.

Brine or salt preserved vegetables, such as peas, lima beans, and snap beans, when prepared for table use, may require considerably more cooking than similar fresh vegetables. This is particularly true for the vegetables that are unblanched (not scalded) prior to salting or brining.

Equipment and Supplies

For containers use sound, clean jars, crocks, kegs, or barrels. If possible use wooden containers that are paraffined inside. Do not use wooden containers made of yellow or pitch pine. Covers will be required to cover the packed vegetables; plates, crock tops, or circular pieces of wood will do satisfactorily. Other necessary items: Kitchen scales; measuring cup; pint, quart, and one gallon jars; clean, white cheesecloth; sharp knives; cabbage cutter; pure salt (see grades listed above); and weights such as paraffined bricks or clean stones other than limestone.

Note: The directions for salting and brining vegetable material contained herein are based chiefly on the joint, U. S. Department of Agriculture-N. C. Agricultural Experiment Station investigational work on food preservation. However, the following additional sources of information on the subject have been consulted and acknowledgment is hereby made for the valuable suggestions used:-

- (1) "Preservation of Vegetables by Fermentation and Salting", Farmers' Bulletin No. 881, U. S. Dept. of Agric., Washington, D. C. (1917).
- (2) "Making Fermented Pickles", Farmers' Bulletin No. 1438, U. S. Dept. of Agric., Washington, D. C. (1927).
- (3) "Pickles and Relishes", Bulletin No. 294, N. Y. State College of Agric., Ithaca, New York, (1937).
- (4) "Brining, Salting and Krauting", Circular No. 293, Georgia Agric. Extension Service, Athens, Georgia. (1942).
- (5) "Preservation of Vegetables by Salting or Brining", Circular No. 119, Montana Agric. Extension Service, Bozeman, Montana. (1942).
- (6) "Salting and Brining Vegetables", Circular No. 478, Missouri Agric. Extension Service, Columbia, Missouri. (1942).
- (7) "Preserving Vegetables by Salting", Circular No. 538, Extension Service in Agric. and Home Economics, Urbana, Illinois. (1942).
- (8) "Preservation of Vegetables by Salting and Brining", Publication No. D-32, Extension Service, Colorado State College, Fort Collins, Colo. (1942).

PRESERVATION BY DRY SALTING

A. Using a Small Amount of Salt (2-1/2 to 5 Percent by Weight).

Dry salt preservation of vegetables by use of a small amount of salt is practiced extensively by commercial concerns and in the home for the production of sauer kraut from cabbage. This process results in the production of acid and gives a distinct tart flavor to the final product.

Vegetables

Cabbage	Rutabagas
Lettuce	Snap beans
Turnips	Beets

Preparation of Vegetables

Select fresh, sound material.

Trim off outside leaves of cabbage and lettuce heads, remove cores and quarter.

Wash root vegetables and trim off tops.

Blanch (scald) snap beans about 5 minutes in boiling water or steamer and cool promptly. Snip the beans and cut into short lengths.

Salting Procedure

After the vegetables have been prepared, proceed as follows:

1. Cabbage, lettuce, turnips, and rutabagas: Shred with a sharp knife or cutter and pack into sound, clean jars, crocks, kegs, or barrels, allowing one-fourth pound (4-oz.) for each 10 pounds of vegetable. Distribute the salt evenly during the filling of the container.
2. For sliced beets and snap beans, distribute evenly one-half pound of salt (8-oz.) with each 10 pounds of material packed. Add 8-oz. of household vinegar for each 10 pounds of snap beans.
3. After the salt-vegetable mixture has been packed into the container, place several layers of clean, white cheesecloth on top of the material and tuck down the sides. On the cloth place a cover that fits loosely inside the container. A plate, crock top, or circular wooden top will do. Weight the cover well so the brine that is formed will reach the cover within 24 hours.
4. Store the containers in a cool place (70 to 75° F.). An acid fermentation starts shortly after the material is salted and will continue for 2 to 3 weeks.

Removal of Scum

A white surface scum will appear on the brine surface within a few days. Keep this scum removed. If allowed to grow unrestricted, it will not only use up the acid produced from the fermentation, but will give off a bad odor and may result in an inferior fermented product.

Scum and insects may be easily removed by the following procedure: Remove the weight and cover, being careful to avoid mixing the scum with the brine. Lift the cloth carefully so that the surface material (scum) is held on the cloth and the brine surface is thereby cleaned. Wash cloth, cover, and weight and replace them. If scum development is rapid, the cleaning operation should be carried out at about two day intervals.

Storage of Preserved Material

After a fermentation period of about 2 weeks it is desirable to repack the fermented material into smaller containers for storage purposes. Pack clean glass jars tightly with the material and fill to within one-fourth to one-half inch of the top with brine from the original container. If there is not enough of this brine, make more brine by adding 1 ounce of salt and 2 ounces of vinegar to each quart of water. Partially seal the jars and heat in a boiling water bath, allowing 25 minutes for pints and 30 minutes for quarts. After removing from the bath, seal jars tightly. This process is not intended to take the place of cooking, but it does help prevent undesirable changes in the material that may occur when it is left in the larger container, exposed to the air, for long periods of time.

Uses of the Preserved Material.

Vegetables preserved by this method may be served alone or according to recipes for sauer kraut.

PRESERVATION BY DRY SALTING

B. Using a Large Amount of Salt (15 Percent by Weight).

Some vegetables are best preserved when a considerable amount of dry salt is used. The legumes, such as shelled green peas, and shelled lima beans, may be placed in this group. Little or no acid is produced during the fermentation at this salt concentration.

Vegetables

Corn	Lima beans
Peas	Snap beans

Preparation of Vegetables

Select fresh, tender, carefully graded material.

Husk corn, remove silk, and boil 10 minutes to set the milk; then cut from the cob.

Shell lima beans and peas.

Select a canning variety of snap beans, wash thoroughly, snip off ends, and cut or break into short lengths.

For best results, peas, lima beans, and snap beans should be blanched (scalded) in boiling water or in a steamer about 5 minutes prior to salting. This treatment results in a better product.

Salting Procedure

After the vegetables have been prepared, proceed as follows:

1. Choose sound, clean containers such as glass jars, crocks, kegs, or barrels; clean thoroughly. If possible, use wooden containers that are paraffined inside. Avoid using containers that are made of yellow or pitch pine.
2. Weigh out vegetables and allow 1-1/2 pounds (about 2-1/2 cups) of salt for each 10 pounds of material. Then put a layer of vegetable and cover with an evenly distributed layer of salt. Continue in this manner until the container is almost full. Do not add too much salt at first.
3. After filling, place on top of the salted vegetables several layers of clean, white, cheesecloth. Place on the cloth a cover that fits loosely inside the container. A plate, crock top, or circular wooden top will do. Weight the cover down well with paraffined bricks or clean stones so that the material will be pressed down firmly and the brine formed will rise to the cover within 24 hours.
4. If sufficient brine is not formed, prepare a strong brine by dissolving 1-1/2 pounds (2-1/2 cups) of salt per gallon of water and add enough of this brine so as to come up over the cover about 2 to 3 inches.
5. Store the containers in a cool place (70 to 75° F.) and keep the brine level up if necessary by adding brine from time to time (prepare brine as described in 4).
6. Keep the brine surface free from insects and any surface growth.

Storage of Preserved Material

After the bubbling has ceased, (this may take several weeks), it is desirable to repack the material into smaller containers for prolonged storage. Pack containers tightly with the preserved material, then add brine from the original container up to the top of the jar. Seal tightly. Do not heat. Rubberized jar caps are not required; caps lined with cardboard and having an oiled paper surface will do. If there is not enough of the original brine to complete the repacking, then prepare new brine as described in 4.

Removing Salt

Vegetable material preserved in this manner requires removal of salt prior to cooking and serving. This can be done by covering with fresh water at the rate of one gallon to each pound of salted material and allow to soak overnight (at least 8 to 12 hours). For one-half pound of salted material use one-half gallon of water.

Uses of Desalted Material

The vegetable material, after the salt has been removed, can be served in various ways, such as in mixed vegetable dishes, creamed style, or in soup mixtures.

Uses of Material without removing the Salt

If vegetable soups are served frequently and in considerable amounts, it is possible to add the salted material directly to the soup stock. Here the salt content of the vegetables is used to season the soup. For two quarts of soup add about one-fourth pound of salted vegetables. For 1 gallon of soup, about one-half pound of salted vegetables can be used directly. Using salted vegetables in this way avoids the losses in food value accompanying desalting or soaking overnight.

PRESERVATION BY BRINING

A. Using a Weak Brine (5 Percent Solution) Plus Vinegar.

Some vegetables can be preserved in a weak brine (5 per cent) in combination with vinegar. This results in a final product having a decidedly acid taste but rather low in salt content.

Vegetables

Carrots

Kale

Cauliflower

Turnip greens

Snap beans

Mustard greens

Green tomatoes

Beet tops

Beets

Preparation of Vegetables

Select fresh, tender, carefully graded material.

In general, prepare the vegetables as for table use by trimming and cleaning.

Wash leafy vegetables several times to remove all traces of grit.

The snap beans (a canning variety) should be washed thoroughly and may be used whole or cut into pieces. They should be blanched (scalded) 5 minutes in a boiling water bath or a steamer and cooled promptly. Blanching in steam is the preferred method.

Wash carrots, beets, and tomatoes, but do not slice.

Brining Procedure

After the vegetables have been properly prepared, proceed as follows:

1. Select sound containers such as large glass jars, crocks, kegs, or barrels and clean thoroughly. If possible, use wooden containers that are paraffined inside. Avoid using wooden containers made of yellow or pitch pine.
2. Pack the vegetable material firmly into the container until nearly full. On top of the packed vegetables place several layers of clean, white cheese-cloth and tuck down the sides. On the cloth place a cover that fits loosely inside the container. A plate, crock top, or circular wooden top will do. Weight the cover down well, using paraffined bricks or clean stones, so that the vegetable material will be pressed down firmly.
3. Prepare the brine for adding to the packed vegetables as follows: Dissolve one-half pound (about 3/4 cup) of salt in 1 gallon of water to which has been added one-half pint (8-oz.) of household vinegar (4 to 5 percent strength acetic acid). The amount of brine necessary to prepare will be equal to about one-half of the volume of vegetable material packed. For example, if a 10 gallon crock of material has been packed, about 5 gallons of brine will be required.
4. Pour the brine over the vegetables until it comes up over the weighted cover. In this treatment, no further salt is required. Store containers in a cool place.

Removal of Scum

A white surface scum will appear on the brine surface in a few days. Keep this scum removed. If allowed to grow unrestricted the material may spoil.

Scum and insects may be easily removed by the following procedure: Remove the weight and cover, being careful to avoid mixing the scum with the brine. Lift the cloth carefully so that the surface scum is held on the cloth and the brine surface is thereby cleaned. Wash cover, cloth, and weight and replace them. If scum development is rapid, the cleaning operation should be carried out at about two day intervals.

Storage of Preserved Material

After a fermentation period of about two weeks, it is desirable, for prolonged storage purposes, to repack the fermented material into smaller containers. Pack clean glass jars tightly with the fermented vegetables and fill to within one-fourth to one-half inch of the top with brine from the original container. If necessary make new brine as described in 3. Place the partially sealed jars in a boiling water bath, allowing 25 minutes for pints and 30 minutes for quarts. After removing from the water bath, complete the sealing. This process is not intended to take the place of cooking, but it does help prevent undesirable changes in the material and losses in nutritive value when the material is left in the larger containers and exposed to the air for long periods of time.

Preparation for Cooking

Material preserved by the weak brine method does not ordinarily require desalting prior to cooking for table use. Rinsing well in water, then covering with fresh water and cooking should reduce the salt content enough for the average taste. However, the vegetables as removed from the brine will have a definitely acid taste. A portion of the acid will be boiled off during cooking; also, some will go into the cooking water. Even so, the final cooked product may be noticeably acid. Many people relish this acid flavor in certain cooked vegetables. If it is not desired in the cooked products, it will be necessary to soak the material (using one or two changes of water) for a short time prior to cooking. This procedure reduces the food value of the material and should be avoided, if possible, or reduced to a minimum.

Uses of the Preserved Material

As indicated above, the preserved vegetables should be first rinsed well with water. They can then be served in various ways to suit the individual taste, such as in mixed vegetable dishes, creamed style, or in soups.

PRESERVATION BY BRINING

B. Using a Strong Brine Solution (15 Percent Solution).

Some vegetables that are to be preserved in the whole state (uncut) or without shelling, such as peas or lima beans in the pod, are best handled by covering with a strong brine solution (15 percent).

Vegetables

Green peas (in the pod)	Pepper hulls
Lima beans (in the pod)	Corn on the cob
Onions (silver skin type)	Snap beans
Whole cauliflower	Carrots

Preparation of Vegetables

Select fresh, tender, carefully graded material.

Do not use peas or lima beans that are too old.

Remove outer skin of the onions (dry).

Trim cauliflower free of stalk and outer leaves.

Cut peppers in half, remove core and seeds.

Husk corn, remove silk, and boil ears 10 minutes to set the milk.

Blanch (scald) snap beans 5 minutes in a boiling water bath or steamer; cool promptly.

Brining Procedure

After the vegetables have been properly prepared, proceed as follows:

1. Select sound containers such as jars, crocks, kegs, or barrels and clean thoroughly. If possible use wooden containers that are paraffined inside. Be sure that they are not made of yellow or pitch pine.
2. Pack the vegetables firmly into the container until nearly full. Keep a record of the weight of the material packed. Place on top of the vegetables several layers of clean, white cheesecloth. Place on the cloth a cover that fits loosely inside the container. Weight the cover down well, using paraffined bricks or clean stones, so that the vegetable material will be pressed down firmly.
3. Prepare a strong brine as follows: Dissolve 1-1/2 pounds of salt (2-1/2 cups) in 1 gallon of water (use 3/4 pound of salt or 1-1/4 cups per 2 quarts of water). The amount of brine necessary to prepare will be equal to about one-half the volume of material packed. For example, if a 10 gallon crock of vegetables has been packed, about 5 gallons of brine will be required.
4. Pour the brine over the vegetables until it comes up over the weighted cover about 2 to 3 inches. Be sure that enough weight has been put on the cover to keep the vegetables under the brine.
5. In order to maintain the original brine strength, salt must be added on the cover, otherwise the brine will become diluted.
6. For every 10 pounds of material packed and brined weigh out 1-1/2 pounds (about 2-1/2 cups) of salt. Place the correct amount of salt carefully on the cover of the container. Avoid letting the salt go down the sides since this will result in a strong layer of brine on the bottom.
7. Store containers in a cool place (70 to 75° F.) and keep the brine level above the cover by adding brine from time to time, (prepared as described in 3).

Storage of Preserved Material

Keep the brine surface free from insects and any surface growth that may form. After the bubbling has stopped (this may take several weeks) it is desirable to repack into smaller containers for prolonged storage. Pack containers tightly with the preserved material, (first removing the lima beans and peas from their pods) and then add brine from the original container up to the top of the jar. Seal tightly. Rubber or rubberized types of seals are not necessary. Caps lined with cardboard and having an oiled surface will do. If there is not enough of the original brine to complete the repacking, then prepare new brine as described in 3.

Removing Salt

Vegetable material preserved in this manner requires removal of salt prior to cooking and serving. This can be done by covering with fresh water at the rate of 1 gallon for each pound of salted material and allowing to soak overnight (at least 8 to 12 hours). For one-half pound of material, use one-half gallon of water (2 quarts).

Uses of Desalted Material

The vegetables, after removing the salt, may be served in various ways such as for mixed vegetable dishes, baked lima beans, creamed style, buttered, and for soups.

Uses of Preserved Material Without Removing the Salt

If vegetable soups are served frequently and in considerable amounts, it is possible to add the rinsed and drained salted vegetables directly to the soup stock. Here the salt content of the preserved material would go to seasoning the soup. Add one-fourth pound of salted material for two quarts of soup. For 1 gallon of soup, about one-half pound of salted vegetables can be used.

Using salted vegetables in this way avoids the losses in food value accompanying desalting or soaking.